Middle Wisconsin River

Nonwadeable Baseline Monitoring-Fisheries Inventory

MWBC = 1179900

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West Central Region

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Abstract

The Wisconsin Department of Natural Resources (WDNR) water program staff sampled the middle Wisconsin River during the 2001 field season as part of the nonwadeable baseline monitoring strategy for Wisconsin's large rivers. A total of thirty-seven species of fish were collected from the middle Wisconsin River using a variety of techniques. Of those thirty-seven species of fish captured, none are listed on the state endangered, threatened or special concern list.

Index of Biotic Integrity sampling (IBI) indicates that the middle Wisconsin River fish community is in good to excellent condition. Logperch was the most abundant fish captured during the IBI sampling runs followed by smallmouth bass and shorthead redhorse. During the gamefish and endangered and threatened species runs (GET), smallmouth bass were the most abundant gamefish followed by walleye, channel catfish and northern pike.

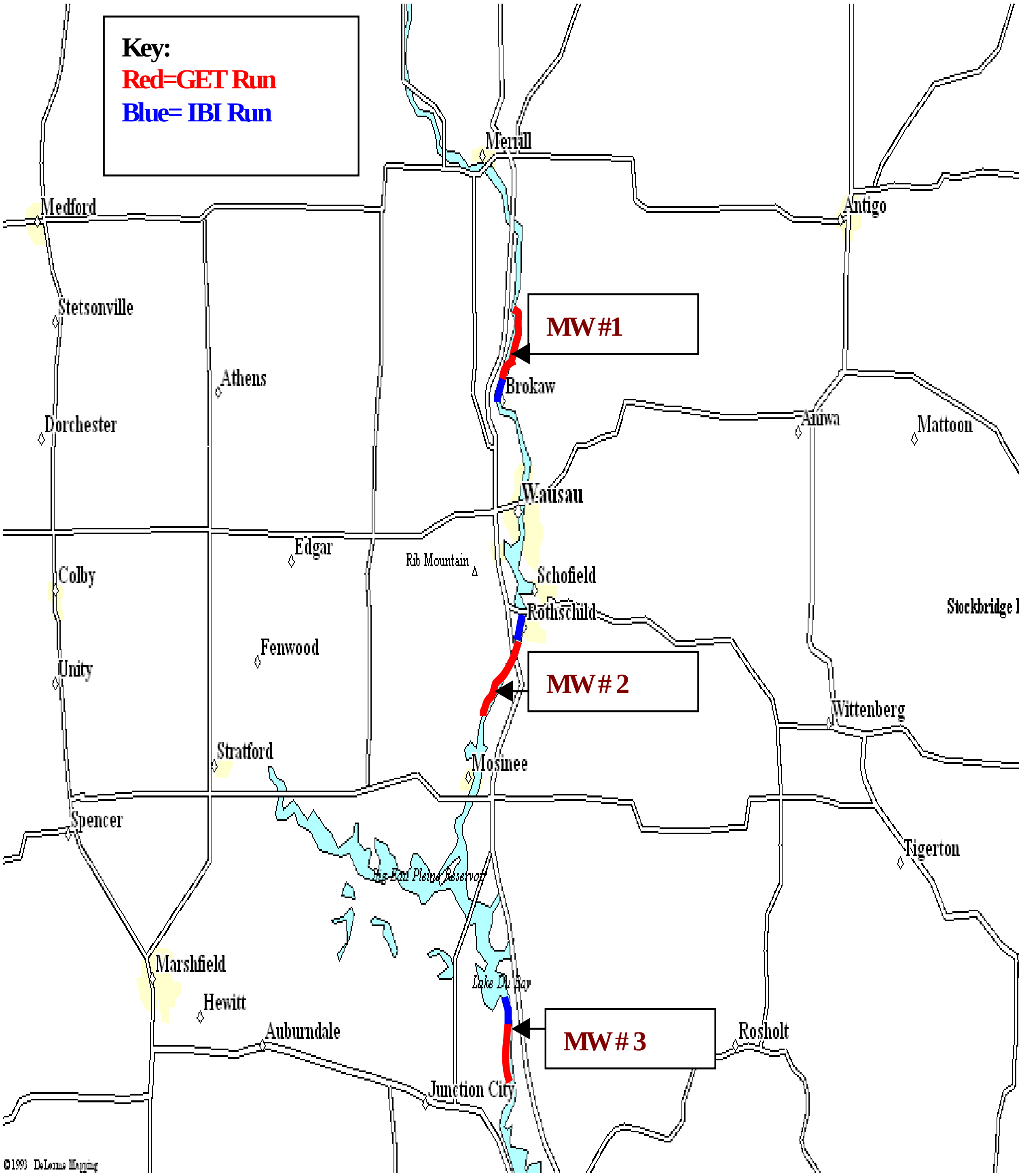
Species diversity on the middle Wisconsin River is poor when compared to other large rivers in the west central region. Most species are habitat generalists. Many of the species found were more typical of lake species than riverine species. Dam construction and habitat fragmentation has undoublty influenced native fish community diversity, abundance and integrity.

Smallmouth bass mortality rates where high at MW #1 (see figure 1) when compared to other sections of the middle Wisconsin River and other larger rivers in the west central region. Walleye abundance was also low, but this could likely be attributed to sampling gear bias or seasonal and diurnal movement.

Overall, the middle Wisconsin River fish community is in good condition. This can be attributed to the fact that near shore habitat conditions are relatively undegraded and that water quality conditions have improved when compared to historic conditions.

Future management should target efforts which avoid and minimize habitat losses associated from various sources. Habitat losses can range from such impacts as water level fluctuations from hydropower operations, fish passage obstruction from dams, fragmentation and destruction of riverine shoreline habitat from landuse changes, near shore habitat losses from development pressures and deterioration of water quality conditions in the watershed. In an effort to maintain the biological integrity of the middle Wisconsin River, all these factors must be taken into consideration and be of equitable importance if the preservation of this river and its associated biological community are to be preserved for future generations.

Figure 1: Sampling sites on the middle Wisconsin River.



Sampling Dates: **August 28, 29, 30-2001**

Field Crew: **Heath Benike, Dean Johnson, Jordan Weeks, Al Hauber, Dale Kuflak , Glenn Falkowski, Eric Donaldson, Todd Kittel, and Joe Behlen**

Data Management: **Heath Benike, Jordan Weeks and BJ Michalek**

INTRODUCTION

As part of the baseline monitoring strategy for non-wadeable rivers in Wisconsin, fisheries staff from the Central Wisconsin Basin and West Central Regional Office sampled the middle Wisconsin River during 2001 field season. The purpose of this survey was to develop a baseline inventory of the existing fisheries resources in the middle Wisconsin River and to make recommendations for future fisheries management activities.

PHYSICAL DESCRIPTION

The middle Wisconsin River for the purposes of this survey started near the Marathon County line and ended downstream of the DuBay Dam. The focus of this survey was in the free flowing section between Trappe Rapids and Brokaw and the Rothschild and Dubay tailwaters (Figure 1).

METHODS

Three stations were established on the Middle Wisconsin River (Figure 1). Each station was divided into two sampling reaches. Each sampling station consisted of a one-mile index of biotic integrity run (IBI) and a longer gamefish and endangered and threatened resources run (GET). Sampling was conducted in late August when water temperatures were above 59 degrees F.

Within the one-mile (IBI) station the following sampling techniques were used:

A. **Large Rivers IBI**: Fish were collected using one pulsed-DC mini-boomshocker during daylight hours. Shocking proceeded downstream operating at approximately 400 volts and 10 amps (80/20 duty/pulse). The catch and effort (minutes) was recorded. Boat operators were instructed to follow the shoreline for a distance of one mile. Dipnetters were instructed to collect fish greater than two inches in length. Species were identified and individual, length and weight information was recorded for all fish captured within the one-mile IBI run. Due to the large biomass of fish collected (mainly non-game fish), several processing stops were made within the IBI run. Any fish that was not identifiable in the field was preserved in a 10% formalin solution for identification purposes.

B. Small Fish Assemblage *(SFA)*

1. Mini-Stream Shocker: Fish were collected using a DC mini-streamshocker equipped with three electrodes operating at approximately 250 volts and 2.5 amps. Three 200 meter stations were established within the one-mile IBI reach. Accessibility and depth were the determining factors to which side of the river was sampled, however an effort was made to sample diverse habitat sites. Effort was recorded in minutes.

All fish collected were identified by species and counted. Any fish that was not identifiable in the field was preserved in a 10% formalin solution for identification purposes.

2. **Gamefish, Endangered and Threatened Species Run (GET):** Fish were collected using one pulsed-DC mini-boomshockers operating at approximately 400 volts and 10 amps (80/20 duty/pulse). Stations started at the end of the IBI station and continued downstream for a distance of approximately 3 miles, at MW #1 the GET station began at Trappe Rapids and continued downstream to the start of the IBI run near Browkaw. Shocking proceeded downstream with one boat covering the shoreline. The catch and effort (minutes) was recorded. Boat operators were instructed to follow the shoreline for entire GET run, but they could "work" cover where appropriate. Dipnetters were instructed to collect all gamefish, endangered and threatened species.

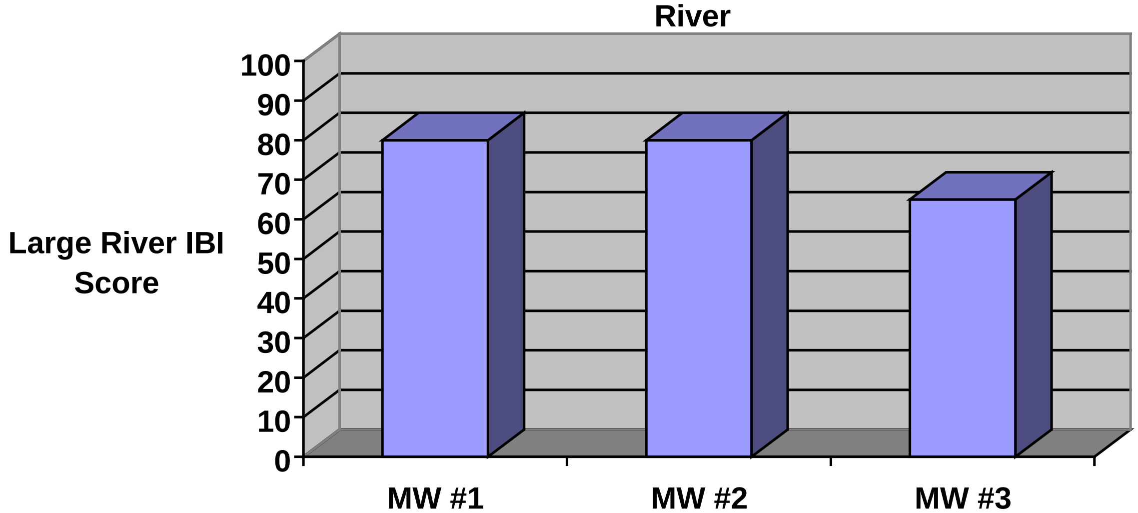
RESULTS / DISCUSSION

LARGE RIVERS IBI

An index of biotic integrity (IBI) for Wisconsin's large river systems was recently developed by the Wisconsin Department of Natural Resources (Lyons, etal 2001). The large river IBI has two primary uses. The first use is as a rapid assessment tool to characterize ecosystem quality at a broad scale and the second use is to evaluate specific management activities to restore river ecosystems (Lyons, etal 2001).

Large rivers IBI scores were calculated for all stations on the middle Wisconsin River (Figure 2). IBI scores ranged between 65-80, which indicates that the overall condition of the middle Wisconsin River fish community is in good to excellent condition.

Figure 2: Large River IBI Scores for the Middle Wisconsin River



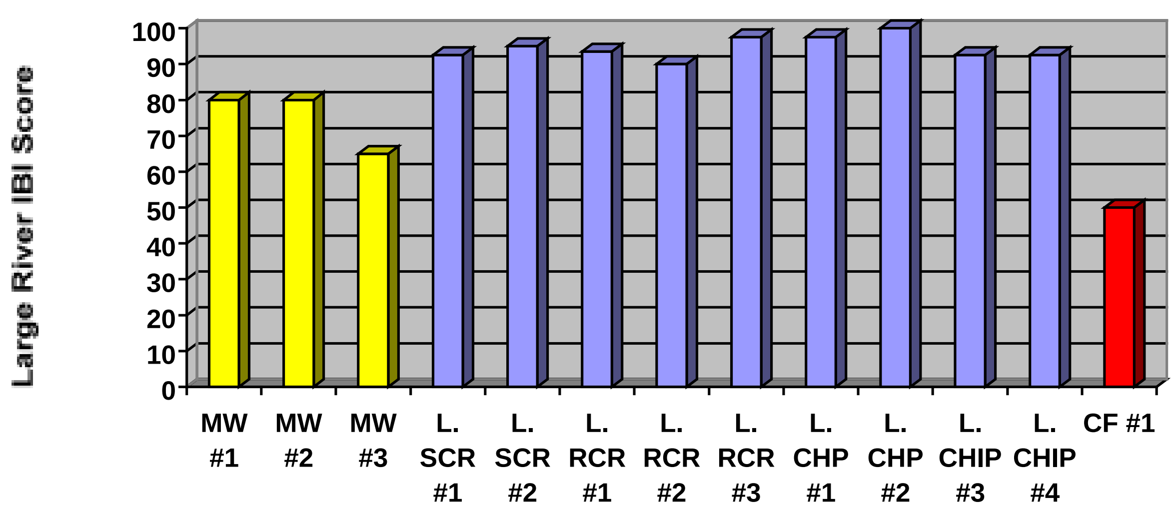
Higher IBI scores were found at the two upstream reaches (MW #1 and MW #2) when compared to downstream reaches (MW #3) . A major reason for the higher IBI ratings upstream is likely due to the fact that habitat fragmentation from dams is not as severe when compared to downstream reaches. Studies have shown that dam construction can negatively impact the native fish communities (Winston and Taylor,1991) (DeJalon, Sanchez and Camargo, 1994) (Bonner and Wilde, 2000). Dam construction and fragmentation has likely reduced overall IBI scores on the middle Wisconsin River. In addition historic water quality conditions could have also reduced IBI scores especially at MW #3 which is downstream of the Big Eau Plaine Reservoir and Lake Dubay. Both impoundments are eutrophic and the Big Eau Plaine Reservoir is listed as a 303d impaired water. Another likely reason why IBI scores were rated as “good to excellent” is that near shore habitat development and habitat fragmentation has been minimized along the riparian corridor, especially at sampling stations MW #1 and MW#3. Most of the riparian corridor is primarily wooded and essentially wildland which consists of a mixture of floodplain forest, backwater oxbows and upland hardwoods. If the existing land use changes along the riparian corridor and near shore habitat becomes fragmented and degraded, it is very likely that the health of the middle Wisconsin River fish community could be adversely impacted.

Comparison of Large River IBI Scores Amongst Comparable Waterbodies

Large rivers IBI scores were calculated from previous survey work on the lower St. Croix, lower Chippewa and lower Red Cedar Rivers in Western Wisconsin. This information can be compared to the middle Wisconsin River. IBI scores were lower on the middle Wisconsin when compared to the lower St. Croix, lower Chippewa and lower Red Cedar Rivers (Figure 3) with one exception. One site on the lower Chippewa scored 50 (CF#1). This site is similar to MW#3. This section of the lower Chippewa River is fragmented by six dams and is impacted by hydropower peaking operations.

This IBI data shows that heavily fragmented sections of river have lower IBI scores when compared to larger free-flowing riverine portions (Figure 3).

Figure 3: Large River IBI Scores from Comparable Large Rivers in the West Central Region

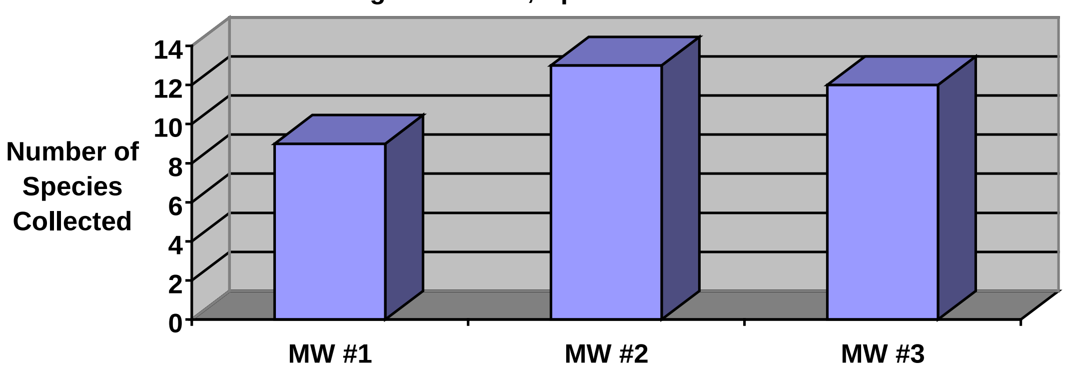


The main reason why IBI scores are lower on the middle Wisconsin River is that dam habitat fragmentation has likely deteriorated native riverine fish communities and have been replaced by lake-like fish communities.   The sections of the lower St. Croix, lower Chippewa and lower Red Cedar Rivers harbor large free flowing riverine habitats with unimpounded access from the larger Mississippi River system. These fish communities are rich in diversity and harbor some of the last remaining strongholds for riverine fishes in the Upper Midwest (Benike 2001 and Benike and Michalek 2001). When comparing these rivers to the middle Wisconsin (which is heavily fragmented by dams) it is evident that conditions have deteriorated. The sites that scored 80 on the middle Wisconsin are located within and or immediately downstream of the last larger free-flowing section of the middle Wisconsin River from Merrill to Wausau. The lower site (MW#3) is heavily fragmented by dams upstream and downstream had a lower IBI score when compared to upstream reaches on the middle Wisconsin River.

Small Fish Assemblage (SFA)

Small fish assemblage sampling provided information on the range and distribution of small fishes in the middle Wisconsin River. Species diversity was higher at MW #2 and MW #3. This can be attributed to the fact that numerous lake-like species were captured at these sites do to the proximity of impounded riverine habitat when compared to MW #1 which was mainly comprised of riverine fish species. A complete listing of species and numbers captured can be found in Appendix A.

Figure 4: SFA; Species Presence and Absence

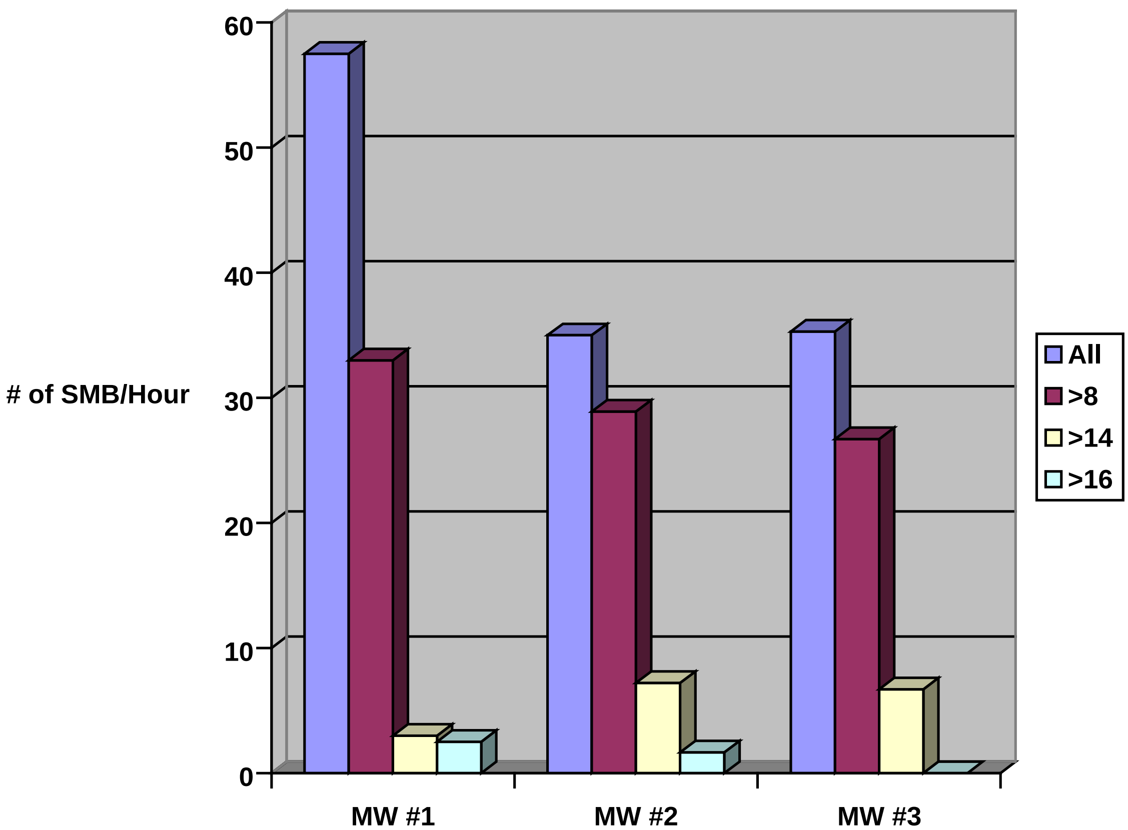


Gamefish and Endangered and Threatened Species Run (GET)

Smallmouth Bass

Smallmouth bass were the most abundant species captured during the GET runs. Smallmouth bass relative abundance is presented in (Figure 5). Overall smallmouth bass relative abundance was highest at MW#1. When looking at the number of legal smallmouth bass (>14 inches). MW #1 had the lowest CPUE, but had the highest CPUE for smallmouth bass greater than 16 inches and no fish greater than 16 inches were captured at MW #3.

Figure 5: Smallmouth Bass Relative Abundance, Middle Wisconsin River

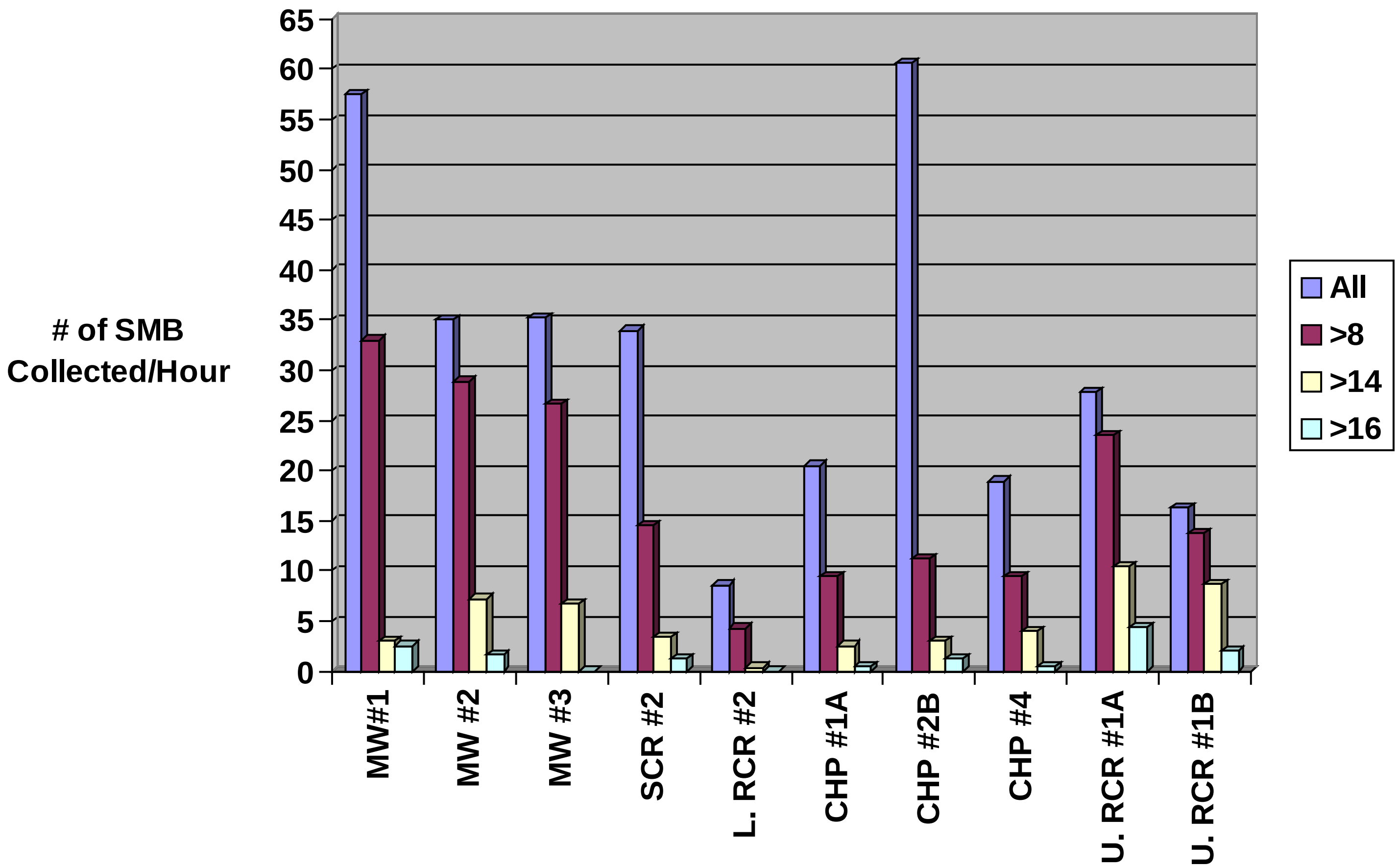


Comparison of Smallmouth Bass Relative Abundance to Comparable Waterbodies.

Trend GET sampling was conducted on the lower St. Croix, lower Chippewa and lower and upper Red Cedar Rivers during the 2001 field season. This information can be used to compare smallmouth bass relative abundance to the middle Wisconsin River (Figure 6).

This data shows that smallmouth bass abundance for fish greater than eight inches is higher on the middle Wisconsin River when compared to other rivers in the West Central Region.

Figure 6: Smallmouth Bass Relative CPUE, West Central Region Large Rivers



Legal size smallmouth bass abundance was also higher on the middle Wisconsin River when compared to the lower Red Cedar River; lower to equal to the lower Chippewa River; variable when compared to the lower St. Croix River, but lower at all stations when compared to the upper Red Cedar River.

Age and Growth

Age and growth information was calculated from scales taken during the GET sampling events. All fish were backcalculated to the beginning of the 2001 growing season using standard (a) values (Carlander 1982). Backcalculated mean length at age is presented in (Figure 7). Growth rates are fairly comparable between the three stations for age 1 and 2 fish. Growth rates are slower at MW #2 for age 3-5 when compared to MW #1 and MW #3. Most fish are reaching the minimum size limit of 14 inches between ages 4-5 at MW #1, and ages 5-6 at MW #2 and MW #3. Aging information for fish greater than 6 years of age, was not used for analysis in this report due to a very small sample size of larger adult fish. Compiled aging data is presented for all smallmouth bass collected in (Table 1). The aging data also shows that the 2000 year class was very poor. This was not due to sampling gear bias considering we collected a fair number of age 0 smallmouth bass when compared to age 1 smallmouth bass during our sampling events. If sampling gear bias was a factor we should not have been able to collect larger number of age 0 fish than age 1 fish during our sampling efforts.

Figure 7: Smallmouth Bass Mean Length at Age. Middle Wisconsin River

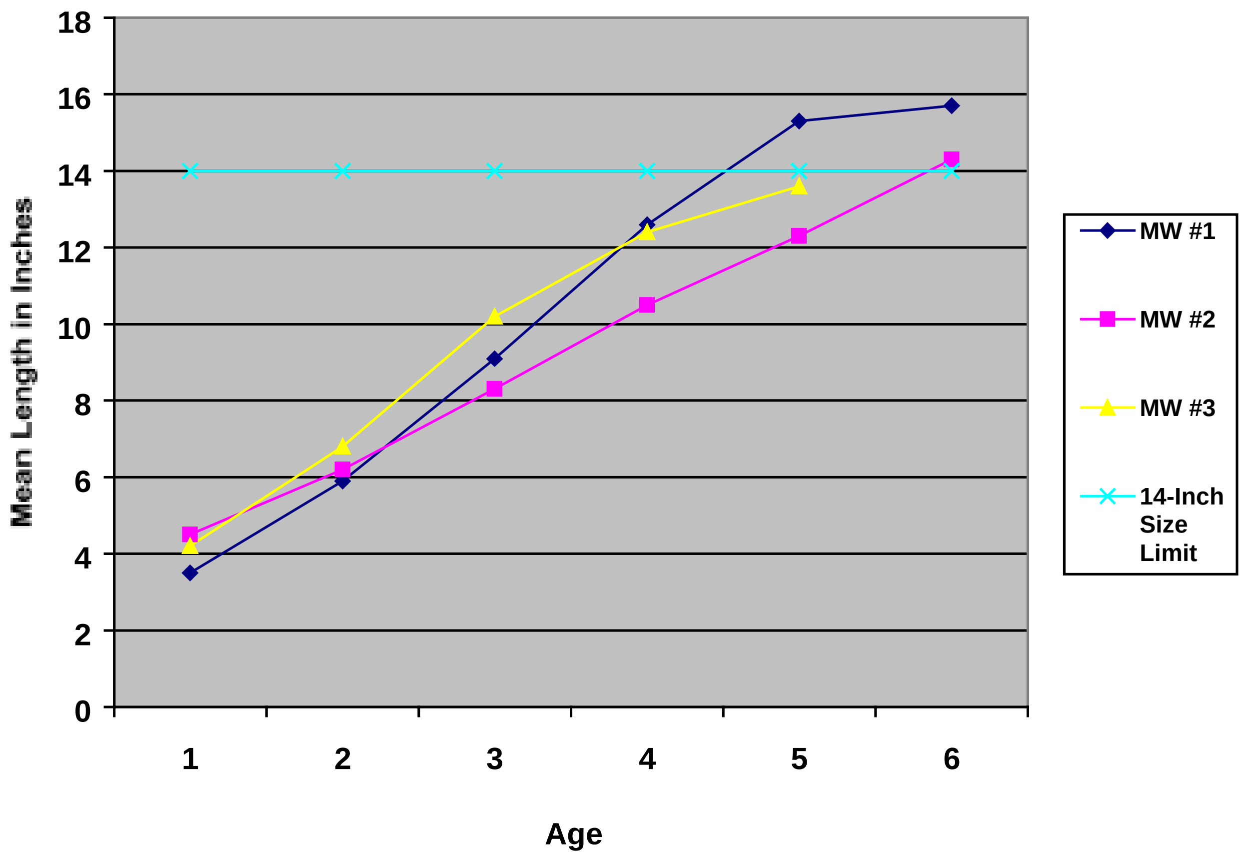


Table 1: Smallmouth Bass Aging Data. Middle Wisconsin River

MW #1

Year Class	Age	# Aged	Mean Length	SD
2001	0	32	0	N/A
2000	1	4	3.5	.24
1999	2	16	5.9	.85
1998	3	28	9.1	1.24
1997	4	4	12.6	1.51
1996	5	3	15.3	.26
1995	6	1	15.7	N/A

MW #3

Year Class	Age	# Aged	Mean Length	SD
2001	0	28	0	N/A
2000	1	2	4.2	.11
1999	2	11	6.8	.77
1998	3	15	10.2	.87
1997	4	24	12.4	.60
1996	5	8	13.6	1.08
1995	6	0	0	N/A
1994	7	1	18.6	N/A

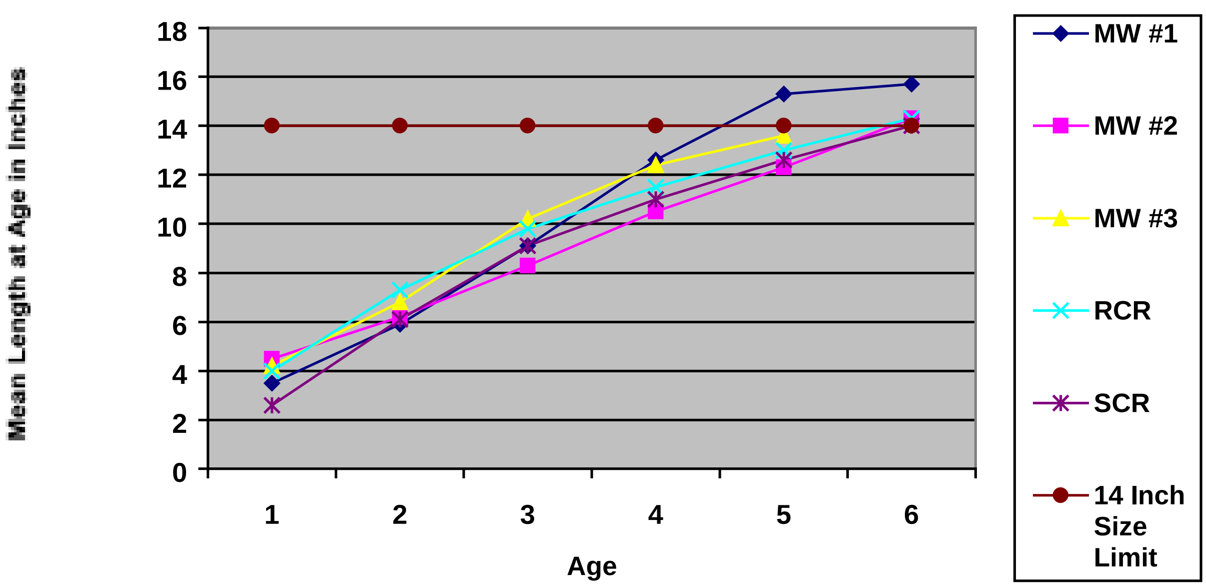
MW #2

Year Class	Age	# Aged	Mean Length	SD
2001	0	8	0	N/A
2000	1	1	4.5	N/A
1999	2	8	6.2	.67
1998	3	11	8.3	.69
1997	4	10	10.5	.07
1996	5	13	12.3	1.50
1995	6	7	14.3	.77
1994	7	1	14.7	N/A
1993	8	1	16.2	N/A
1992	9	0	0	N/A
1991	10	1	18.7	N/A

Comparison of smallmouth bass growth rates with comparable waterbodies.

Aging information was collected from the lower St. Croix and lower Red Cedar Rivers during the 1999 field season. This information can be used to compare growth rates with smallmouth bass on the middle Wisconsin River. Smallmouth bass growth rates for the three rivers are presented in (Figure 8). This data shows that MW #1 and MW #3 have higher or similiar growth rates when compared to other larger rivers in the West Central Region. This data also shows that MW #2 is fairly slow growth rates when compared to other larger rivers in the West Central Region.

Figure 8: Smallmouth Bass Mean Length at Age, West Central Region Large Rivers



Mortality Estimates

Mortality estimates were calculated using a standard catch curve for smallmouth bass on the middle Wisconsin River. Mortality estimates are provided for the middle Wisconsin river and other larger rivers in the west central region in (Table 2). Mortality estimates were not calculated at MW #3 due to a small sample size.

Table 2: Mortality estimates from the middle Wisconsin River and other large rivers in the WCR.

Station	Month	Year	Age Range	Annual Mortality	R-Squared
MW#1	Aug	2001	2-8	60%	.92
MW#1	Aug	2001	3-8	67%	.95
MW#2	Aug	2001	2-8	33%	.92
MW#2	Aug	2001	3-8	28%	.95
SCR	Sept	1999	2-8	48%	.93
SCR	Sept	1999	3-8	49%	.90
RCR	Sept	1999	2-8	50%	.92
RCR	Sept	1999	3-8	49%	.87

This data shows that mortality estimates at MW#1 are considerably higher when compared to other larger rivers in the West Central Region. It is currently unknown what factors may be attributing to higher mortality rates, but this should be researched in more detail sometime in the future.

Smallmouth Overall

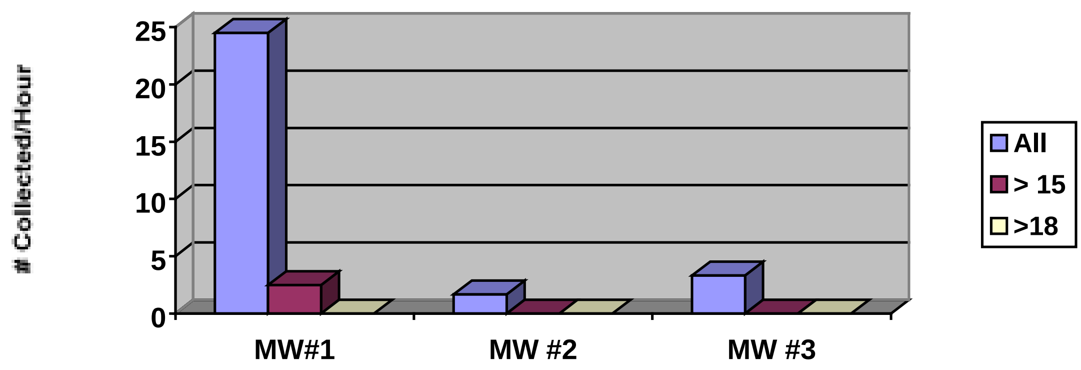
Smallmouth relative abundance is higher on the middle Wisconsin River when compared to other large river systems in the West Central Region when comparing the number of fish collected greater than 8 inches and variable when comparing the number of legal sized fish. Age and growth information suggests that growth rates are not a problem at MW #1 and MW#3, but MW#2 showed the slowest growth rates for rivers in the West Central Region. Mortality estimates are very high at MW#1 when compared to other regional large rivers. This should be further evaluated to determine what may be causing this anomaly and determine if protective regulations are warranted.

Walleye

Walleye CPUE values are presented in (Figure 9). Walleye CPUE values were highest at MW#1 on the middle Wisconsin River. CPUE values for MW#2 and MW#3 were considerably lower, but sampling gear bias may have provided this lower number because MW#2 and MW#3 are more lake-like lake than riverine in nature.

Walleye relative abundance was considerably higher at MW#1 when compared to MW #2 and MW #3. No legal sized walleye were captured at MW #2 or MW#3. In addition no fish greater than 18 inches were collected at any stations on the middle Wisconsin

Figure 9: Walleye CPUE from the Middle Wisconsin River

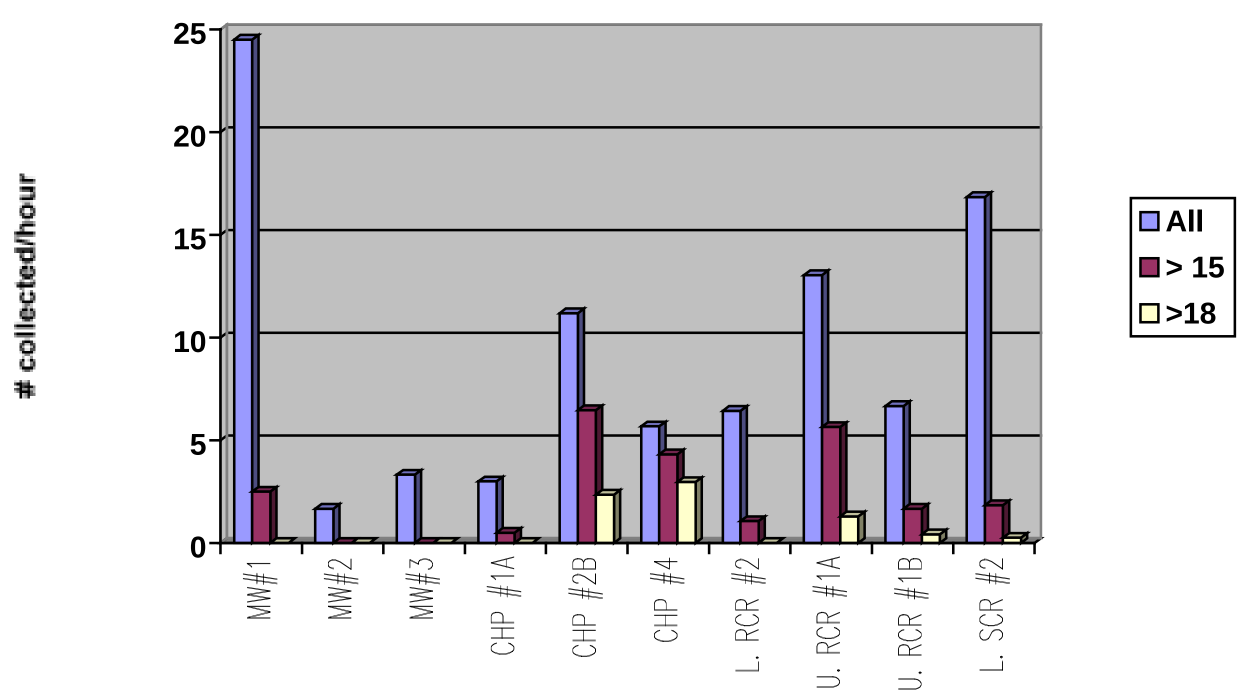


River. Sampling gear bias or seasonal movement at MW#2 and MW#3 could be the major factor for the lower walleye CPUE.

Comparison of Walleye Relative Abundance with comparable Waterbodies.

Trend GET sampling was conducted on the lower St. Croix, lower Chippewa and lower and upper Red Cedar Rivers during the 2001 field season. This information can be used to compare walleye relative abundance to the middle Wisconsin River (Figure 10).

Figure 10: Walleye Relative Abundance. West Central Region Large Rivers



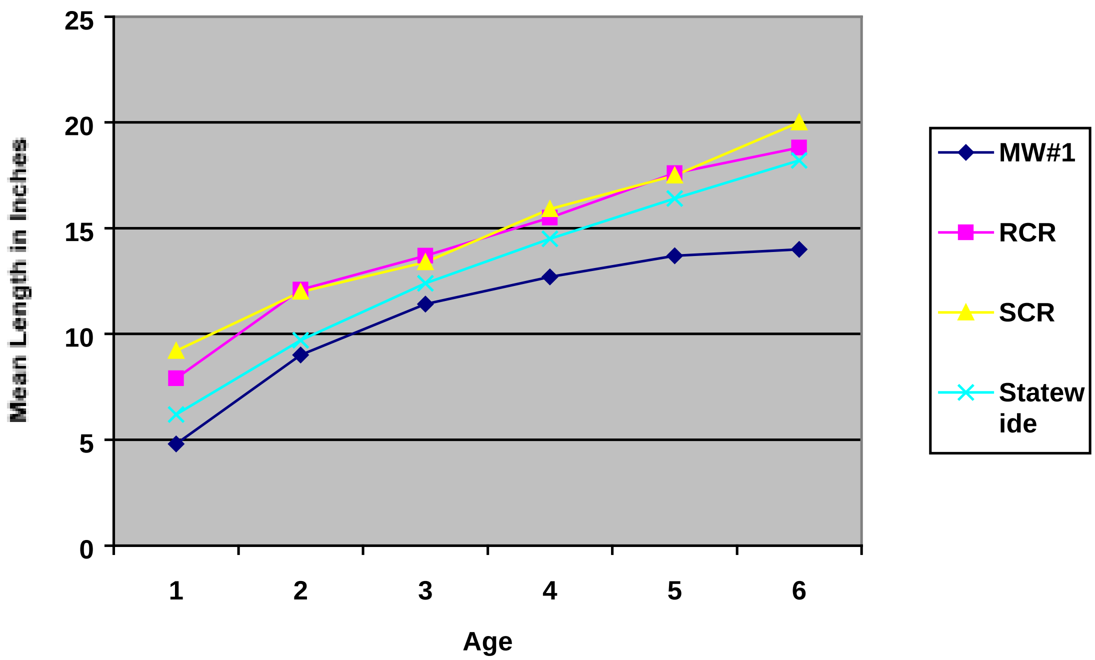
Walleye abundance is relatively poor on the middle Wisconsin River when compared to other regional larger rivers especially for fish greater than 18 inches. Once again sampling gear bias at MW #2 and MW#3 could be attributing to this, but MW #1 is very similar to habitat conditions on the lower Chippewa, lower St, Croix and lower and upper Red Cedar Rivers and walleye abundance is considerably lower for fish greater than 15 inches.

Seasonal movement of Walleye at MW #2 and MW#3 into more lake-like habitat downstream of these stations could explain the lower abundance levels at these two stations or that we were unable to effectively sample walleye at these two stations due to sampling gear bias or that walleye abundance in these riverine reaches are low during the summer months

Age and Growth

Age and growth information was calculated from scales taken during the GET sampling events. All fish were backcalculated to the beginning of the 2001 growing season using standard (a) values (Carlander 1982). Due to a small sample size, growth rates for MW#2 and MW#3 will not be presented in the report. Growth rates for MW#1 are presented in (Figure 11). In addition growth rates for the lower Red Cedar and lower St. Croix River and the statewide average are presented in (Figure 11).

Figure 11: Walleye Growth Rates, West Central Region Large Rivers



Growth rates at MW #1 are considerably slower when compared to the lower Red Cedar and lower St. Croix River. This could be somewhat attributed to a smaller sample size of walleye at MW#1 when compared to the lower St. Croix and lower Red Cedar Rivers, but it is also likely that walleye growth rates are lower on the MW#1 due to the factors which are currently unknown.

Table 3: Walleye Aging Data MW#1

Year Class	Age	# Aged	Mean Length	SD
2000	1	6	4.8	.75
1999	2	2	9.0	.06
1998	3	10	11.4	1.28
1997	4	11	12.7	.78
1996	5	9	13.7	.88
1995	6	2	14.0	.20

Mortality Estimates

Mortality estimates were calculated at MW#1 using a standard catch curve. Mortality Estimates were not calculated at MW #2 or MW #3 due to a small sample size. Mortality estimates at MW #1 are presented in (Table 4).

Table 4: Walleye Mortality Estimates Middle Wisconsin River

Month	Year	Age Range	Annual Mortality	R-Squared
August	2001	2-5	40%	.65
		3-5	57%	.84

Walleye Overall

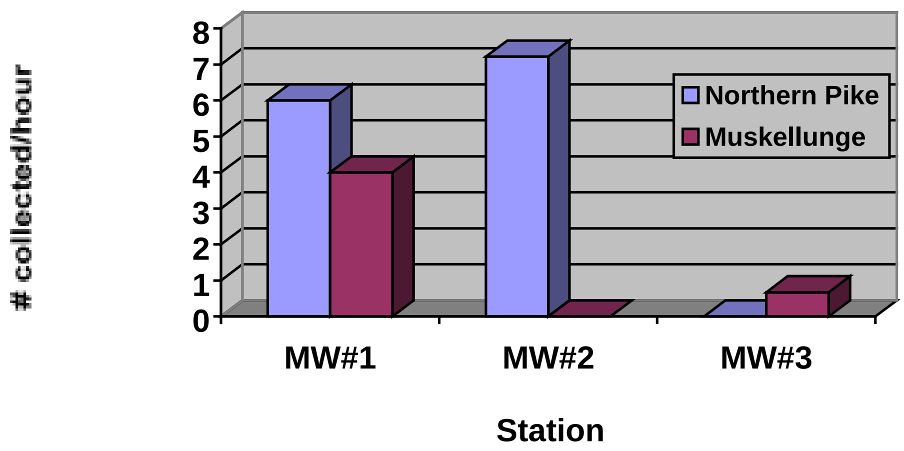
Walleye abundance on the middle Wisconsin River is lower when compared to other large rivers in the West Central Region. Seasonal movement or sampling gear bias may be attributing two these lower numbers. Growth rates are also lower at MW#1 when compared to other larger rivers in the West Central Region and mortality estimates are generally comparable to other larger rivers, but the sample size used was considerably small and the data should be used with caution.

In the future additional sampling techniques should be used to better understand walleye abundance in the middle Wisconsin River and how it may compared to other regional larger rivers. The updated nonwadeable baseline monitoring strategy includes a percid assessment in the fall or spring to better estimate walleye relative abundance. It is recommended that this sampling protocol is used in the future at MW #2 and MW #3 to better document walleye abundance and this information can be compared to other larger rivers in the region.

Northern Pike and Muskellunge

Northern pike and muskellunge relative abundance is presented in (Figure 12). Overall, Northern pike abundance was similar at MW #1 and MW#2 but no Northern Pike were collected at MW #3. Muskellunge were captured and MW#1 and MW#3 and MW#1 had the largest number of quality sized fish. Four of eight muskellunge collected at this station were greater than 34 inches and the largest was measured at 50 inches and weighed 39.5 pound (see report cover for photo). This is likely the result of this reach of river having a 40-inch minimum length limit for muskellunge since 1992.

Figure 12: Northern Pike and Muskellunge Relative Abundance, Middle Wisconsin River



Channel Catfish

Channel Catfish were collected at MW#2 and MW#3. Relative abundance was 1.67 and 7.33 fish per hour respectively. No channel catfish were collected at MW #1. Catfish were introduced into the middle Wisconsin River in 1979. A total of 6,000 fish ranging in size between 4.0 and 8.0 inches were stocked at Gilbert Park which is approximately 5 miles below the lower end of station MW #1. Prior to 1979, channel catfish were not known to exist in the middle Wisconsin River. In addition 93% of the channel catfish that were collected on the middle Wisconsin River were above 20 inches in length.

Lake Sturgeon

No lake sturgeon were captured during this sampling event. Lake sturgeon recovery efforts are currently underway by Central Wisconsin Basin fisheries staff at MW #3. Station MW#1 appears to have adequate large river habitat for lake sturgeon and it should be evaluated as a candidate site for lake sturgeon recovery efforts. Lake sturgeon reintroduction efforts have been concentrated in the reach of river downstream of the DuBay dam, which includes the Stevens Point Flowage. The program started with transfers of 145 sub-adult and adult fish (34.7 to 44.0 inches) from Lake Wisconsin between May 1991 and Oct. 1992. Since 1997, fingerling sturgeon have been stocked annually using eggs obtained from lower Wisconsin River fish. Stocking levels have ranged between 8,000 and 15,000 fingerlings per year.

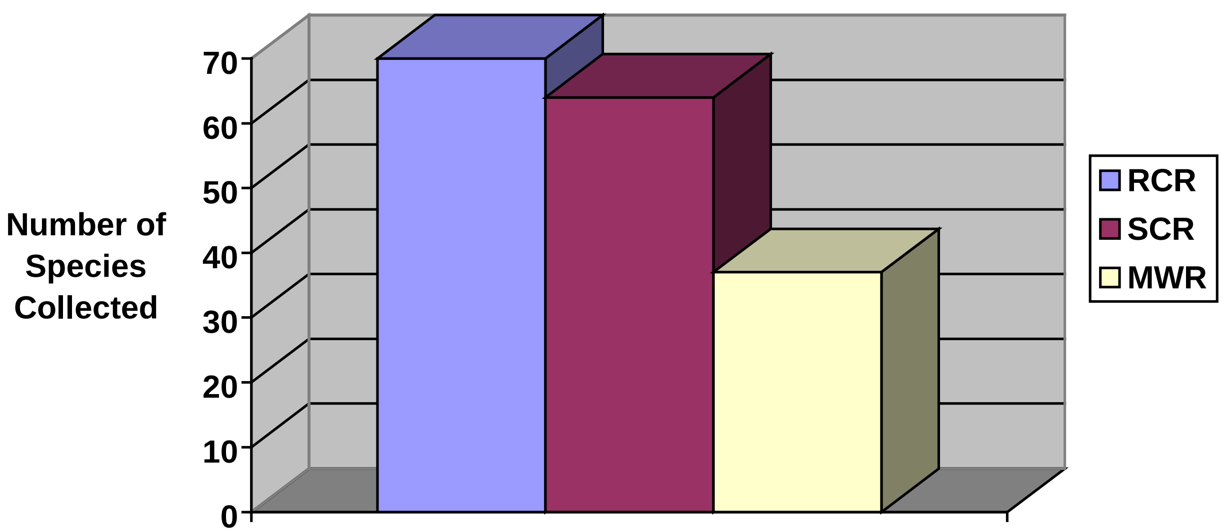
Endangered and Threatened Species

No endangered or threatened species were collected during this sampling event on the middle Wisconsin River. Black Redhorse (state-listed endangered species) have been collected in the middle Wisconsin River within the past decade but we did not capture any during our sampling efforts.

Species Diversity Overall-All Sampling Methods Combined

When comparing the total number of species collected using all sampling gears combined species diversity is considerably lower on the middle Wisconsin River when compared to the lower St. Croix and lower Red Cedar Rivers in the West Central Region (Figure 13). This is likely due to habitat fragmentation from dam construction on the middle Wisconsin River whereas the lower St. Croix and lower Red Cedar Rivers are free-flowing and are directly connected the Mississippi River system

Figure 13: Total Number of Species Collected All Sampling Gears Combined



Management Recommendations

Fisheries

1. Smallmouth Bass: Further evaluations should be conducted to determine what factors may be attributing to higher smallmouth bass mortality rates at MW #1. This section had considerably higher mortality rates when compared to other section of the middle Wisconsin and other larger rivers in the West Central Region.

2. Sturgeon: No sturgeon were collected during this survey. Recent recovery efforts have begun on the middle Wisconsin River by Central Wisconsin River Basin fisheries staff. MW#1 should be evaluated as a possible re-introduction site for Lake Sturgeon.

Trends Monitoring

3. Walleye: Future baseline monitoring activities should be targeted at nighttime tailwater sampling using an percid index run as per the updated nonwadeable baseline monitoring strategy. Current daytime GET monitoring likely underestimates walleye relative abundance in the Middle Wisconsin River at MW#2 and MW#3.

4. Channel Catfish: Future baseline monitoring activities should be targeted towards benthic sportfish assessments following the updated baseline monitoring strategy at MW #2 and MW #3.

5. Daytime electrofishing should be used as an annual trend monitoring site at MW #1.

Habitat Protection

6. Habitat conditions at MW #1 are relatively undegraded. This section of river supports a healthy sportfishery and is currently mostly wildland that is unfragmented by development pressure. Protection of this section of river should be a high priority for the Department and our local partners. Protection activities could consist of fee or easement acquisition of riparian lands through the Departments land legacy initiative or by a local non-profit organization that has in interest in protecting critical large river riparian lands. In addition, shoreland zoning regulations could be enhanced in this reach to better protect nearshore habitat if local support for those changes were warranted.

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Appendix A

1. Detailed sampling station maps

3. GET Summary Sheets

4. GET Length Distributions (Walleye and Smallmouth Bass)

5. Species Catch by Gear Type, by station and all stations combined